

RECEIVED  
CENTRAL FAX CENTER  
JUN 09 2009

Application No. 10/594,307  
Attorney Docket No. NE353-PCT(US) (TAK-054)

AMENDMENTS TO THE CLAIMS:

1. (Currently Amended) A tunable laser, comprising:
  - a multiple ring resonator in which a plurality of ring resonators, which are constituted with ring-type waveguides having optical path lengths different from each other, are coupled through an optical-coupling device;
  - an LD-side waveguide having a first end connected to one of the plurality of ring resonators through an optical-coupling device;
  - a reflection-side waveguide having a first end connected to other one of the plurality of ring resonators through an optical-coupling device;
  - a single board on which the ring resonator, the LD-side waveguide and the reflection-side waveguide are formed;
  - a reflection film provided to a second end of the reflection-side waveguide; wherein said reflection film comprises a high-reflection film capable of reflecting laser light without regard to a wavelength of a transmission peak of said laser light;
  - a laser diode chip having a low reflection film formed on one of two opposing emission end faces, which is optically coupled to the LD-side waveguide through the low reflection film; and
  - a tuning device for changing a resonance wavelength of only the multiple ring resonator.
2. (Original) The tunable laser as claimed in claim 1, wherein the multiple ring

Application No. 10/594,307  
Attorney Docket No. NE353-PCT(US) (TAK.054)

resonator contains at least two or more of the ring resonators.

3. (Original) The tunable laser as claimed in claim 1, wherein the low reflection film of the laser diode chip is abutted against the LD-side waveguide to be optically coupled.

4. (Original) The tunable laser as claimed in claim 1, wherein the low reflection film of the laser diode chip is optically coupled to the LD-side waveguide through an optical device.

5. (Previously Presented) The tunable laser as claimed in claim 4, wherein the optical device comprises a lens.

6. (Previously Presented) The tunable laser as claimed in claim 1, wherein, in the plurality of ring resonators, diameters of the ring waveguides are set so that intervals of reflection peaks appearing periodically become different, and there generates a resonance at a meeting point of the reflection peaks.

7. (Previously Presented) The tunable laser as claimed in claim 1, wherein the optical coupling devices comprise directional couplers.

8. (Previously Presented) The tunable laser as claimed in claim 1, wherein the tuning device changes refractive indexes of the ring-type waveguides of the ring resonators for changing the resonance wavelength.

Application No. 10/594,307  
Attorney Docket No. NE353-PCT(US) (TAK.054)

9. (Previously Presented) The tunable laser as claimed in claim 7, wherein the tuning

device changes refractive indexes of the ring-type waveguides by utilizing temperature

properties of the ring-type waveguides.

10. (Previously Presented) The tunable laser as claimed in claim 1, further comprising a

wavelength detecting device for detecting a resonance wavelength of the multiple ring

resonator.

11. (Previously Presented) The tunable laser as claimed in claim 10, wherein the

wavelength detecting device lets through or shields light of only a specific range of

wavelengths to detect the wavelength.

12. (Original) The tunable laser as claimed in claim 10, comprising a control device for

feedback-controlling resonance of the multiple ring resonator based on resonance wavelength

information detected by the wavelength detecting device.

13. (Original) The tunable laser as claimed in claim 1, wherein a stray light suppressing

part for suppressing influence of a stray light that is emitted from an end face extended from

one end of the LD-side waveguide or an end face extended from one end of the reflection-

side waveguide is provided.

14. (Original) The tunable laser as claimed in claim 1, wherein a filter for letting through

light of only a specific range of wavelengths is inserted at least to one place selected from the

Application No. 10/594,307  
Attorney Docket No. NE353-PCT(US) (TAK.054)

LD-side waveguide between the multiple ring resonator and the laser diode chip, the reflection-side waveguide between the multiple ring resonator and the high reflection film, and between the ring resonators.

15. (Original) The tunable laser as claimed in claim 1, wherein a light-receiving element is provided to an end face that is extended from one end of the LD-side waveguide or an end face that is extended from one end of the reflection-side waveguide.

16. (Previously Presented) The tunable laser as claimed in claim 1, wherein the laser diode chip is mounted on the board by a passive alignment technique which thereby renders alignment of the optical axis unnecessary.

17. (Previously Presented) The tunable laser as claimed in claim 15, wherein the light-receiving element is mounted on the board by a passive alignment technique which thereby renders alignment of the optical axis unnecessary.

18. (Previously Presented) The tunable laser as claimed in claim 1, wherein the reflection film comprises one of a dielectric multilayer film and a metal film.

19. (Currently Amended) The tunable laser as claimed in claim 1, wherein ~~reflective properties of the reflection film remain substantially constant reflects laser light without tuning regardless of said changed resonance wavelength of said multiple ring resonator.~~

Application No. 10/594,307  
Attorney Docket No. NE353-PCT(US) (TAK.054)

20. (Previously Presented) The tunable laser as claimed in claim 1, wherein said tuning device changes the resonance wavelength of said multiple ring resonator only by utilizing temperature properties of the ring-type waveguides.

21. (Currently Amended) The tunable laser as claimed in claim 20, wherein said tuning device changes the resonance wavelength of said multiple ring resonator only by adjusting a temperature of each of the ring-type waveguides.

22. (Previously Presented) The tunable laser as claimed in claim 14, wherein a feedback control is executed such that the resonance wavelength becomes constant.

23. (Previously Presented) The tunable laser as claimed in claim 9, wherein film-like heaters are provided as the tuning device.

24. (Previously Presented) The tunable laser as claimed in claim 23, wherein said film-like heaters are formed on said single board.

25. (Currently Amended) The tunable laser as claimed in claim 6, wherein a wavelength of said reflection peak can be shifted over entire regions of the C-band and L-band (1.53 micron – 1.625 micron, (1.56 μm – 1.59 μm)).

26. (Previously Presented) The tunable laser as claimed in claim 8, wherein the tuning device changes the resonance wavelength of the ring-type waveguides only by temperature-

Application No. 10/594,307  
Attorney Docket No. NE353-PCT(US) (TAK.054)

adjusting a refractive index of each of the ring-type waveguides.